
MAP OF
SOUTHERN MEXICO AND CENTRAL AMERICA SHOWING LOCALITIES OF TUBERCULAR SPECIES OF
Coleonyx
C. mitratus
C. e. elegans
C. e. nemoralis
Elegans-nemoralis intergrade

TRANSACTIONS

OF THE

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THE TRANSVERSE VOLCANIC BIOTIC PROVINCE OF CENTRAL MEXICO AND ITS RELATIONSHIP TO ADJACENT PROVINCES

BY

ROBERT T. MOORE

SAN DIEGO, CALIFORNIA
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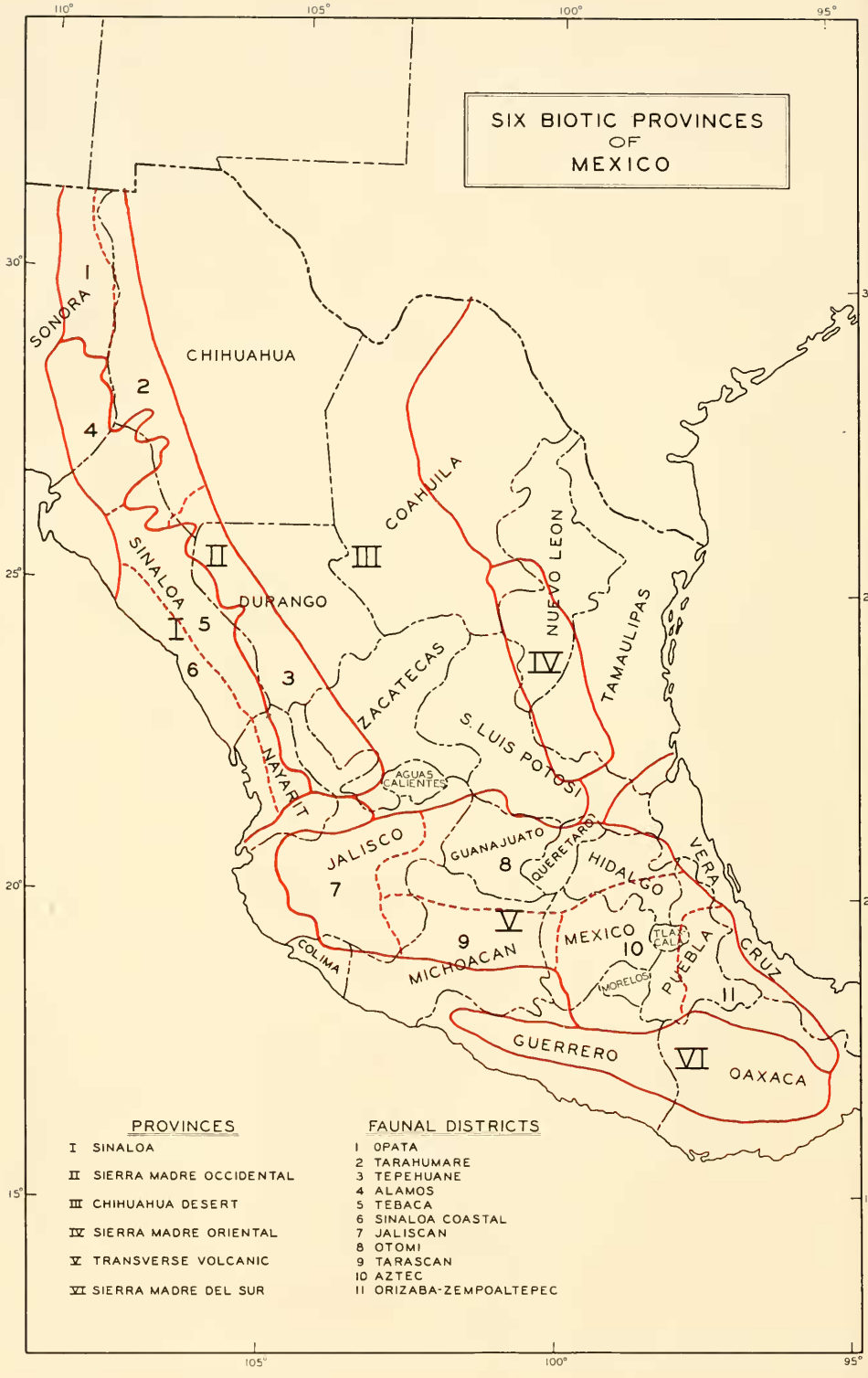
SIX BIOTIC PROVINCES
OF
MEXICO
110°
105°
100°
95°
30°
25°
20°
15°
SONORA
CHIHUAHUA
COAHUILA
NUEVO LEON
TAMAULIPAS
SINALOA
DURANGO
ZACATECAS
S. LUIS POTOSI
NAYARIT
AGUAS CALIENTES
JALISCO
GUANAJUATO
QUERETARO
HIDALGO
VERA CRUZ
COLIMA
MICHOACAN
MEXICO
TLAX CALA
PUEBLA
MORELOS
GUERRERO
OAXACA
I
II
III
IV
V
VI
1
2
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11
PROVINCES
I SINALOA
II SIERRA MADRE OCCIDENTAL
III CHIHUAHUA DESERT
IV SIERRA MADRE ORIENTAL
V TRANSVERSE VOLCANIC
VI SIERRA MADRE DEL SUR
FAUNAL DISTRICTS
1 OPATA
2 TARAHUMARE
3 TEPEHUANE
4 ALAMOS
5 TEBACA
6 SINALOA COASTAL
7 JALISCAN
8 OTOMI
9 TARASCAN
10 AZTEC
11 ORIZABA-ZEMPOALTEPEC

THE TRANSVERSE VOLCANIC BIOTIC PROVINCE OF CENTRAL MEXICO AND ITS RELATIONSHIP TO ADJACENT PROVINCES*

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ROBERT T. MOORE

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Students of biotic relationships have overlooked the importance of the great volcanic area, which stretches across the southern end of the Central Plateau of Mexico, extending west and east to within fifty miles of the Pacific and Atlantic Oceans respectively. Perhaps this is due in part to a lapsus in our maps, which seldom have shown a name for this range, but which is known and feared by the Indians as the Sierra de Anáhuac. The maps give one an impression of a series of unimportant isolated peaks. The truth is quite different! Here vulcanism has reached its zenith of power and destruction. It has created hundreds of mighty cones, many extinct, massed and concentrated transversely across an enormous volcanic belt, four hundred miles long by sixty wide. Pumice, tuff and lava have been poured over the region again and again in enormous quantities so that the valleys and pockets of this range are conditioned by an entirely different set of environments from those of the two north-south sierras, and zoological life within them has been profoundly and continuously modified by the ever changing conditions for more than a million years. It is true that there are scattered volcanoes in other areas of Mexico, but were they lumped together, their total effect upon wild-life would not compare with that of the mighty Anáhuac.

According to Schuchert (1935, p. 129), "this mountainous area of southern Mexico . . . . . extends from Cape Corrientes on the west coast to Jalapa, Veracruz. . . . . It has a wild rugged topography due . . . . . to the vast quantities of volcanic material that have been ejected from numerous vents and piled upon it: lavas, tuffs, and pumice, together with deposits of Pliocene and Pleistocene lakes." Thayer (1916, pp. 89-90) writes: "It appears that there have been two periods of vulcanism in this province: the first in the Miocene and affecting

* Contribution from the California Institute of Technology, Pasadena, Calif.

all of Mexico; the second beginning in the Pliocene and continuing to the present time and limited to this province." Again Schuchert (1935, p. 133) writes that in the late Pliocene and the Pleistocene "came the very great epeirogenic elevation, which produced present Mexico, elevating the land 3000-4000 feet in the north and 7000-8000 feet south of Mexico City." It was partly during this period that the great transverse volcanic southern front was raised above the Central Plateau of Mexico, which Thayer and Schuchert term the "Anáhuac Plateau."

The tremendous display of vulcanism, which persisted for a vast period of time, not only continued to raise this front much higher, but also produced the gigantic volcanic cones which exist today. The new volcano, Paricutín, which arose from a cornfield in central Michoacán and which was visited by the author when it was only a few weeks old in March, 1942, and again six months later, although it has affected an area over three hundred miles in diameter with a great deposition of ash, can be classed, at least up to the present time, as only a minor disturbance in the continuous transformation of the area for the past two million years by much greater volcanoes of the region. High as these are, reaching an altitude of 18,250 feet in the case of Mount Orizaba, they are merely "stubs of former peaks, which have been reduced by erosion." Thirteen of them range above 12,000 feet in altitude and only three others higher than 12,000 feet are located outside of this region; one of them, Mount Zempoaltepec in southeastern Oaxaca, is deemed to be within the southern boundary of the province, from the zoological viewpoint, making the fourteenth over 12,000 feet. Another, Mount Mohinora in extreme southwestern Chihauhua, which was ascended and its birds collected in 1937 by the author, is believed by him to be slightly lower than 12,000 feet from the performance of his aneroid, although airplane pilots claim it is nearer 13,000.

The effect of the deposition of ash, not to speak of the enormous quantity of igneous vapors constantly pouring into the atmosphere, on the mammals, birds and other creatures of the area, can hardly be exaggerated. On his visits to Paricutín, as well as on his ascents either to the summits (or nearly to them) of three others of the great volcanoes of the region, the author personally has noted the disastrous results of volcanic phenomena on bird-life and mammals. At Morelia, nearly 80 miles as the crow flies from Paricutín, the trees and plants appeared as if a black blizzard had struck them, every leaf being covered with ash to a depth from one to two inches. At Pátzcuaro, sixty miles

away, the marginal waters of the lake had a consistency of heavy black cream, a dense shroud of fine ash blotted out the sun and vision was restricted as at twilight. Seed-eating birds hunted futilely over the blanket of ash and insect-eaters found the leaves and trunks of trees so covered that the dead remains of insects beneath could not be disinterred. As we approached the volcano, the blanket of ash increased in depth until, at a distance of five miles, it averaged three feet and everything had the appearance of death, with the exception of the blackened exterior needles on outer branches of pines. Such birds as survived were obviously weakened, while nests had been destroyed, so that the effect upon them must have been profound. Yet a survival characteristic seemed to be present in these sturdy residents. During the first few months, when the ash plume was blown steadily toward the east, residents, such as bluebirds, on the west side were observed fearlessly carrying on their activities within a half mile of the belching cone.

Fortunately the region receives summer rains and the ash is fertile. The highly elevated region at the southern end of the plateau serves as an enormous dam, four hundred miles in length, which has forced its streams to flow towards the north and they in turn have developed the great river system of the Lerma, the longest wholly contained within the country. Here are the finest lakes of Mexico, one of them, Lago de Chapala, being the largest of all, eighty miles long by thirty-five wide. This fluvial system with its marshes is inhabited by interesting endemic forms of bird-life, and, when its birds have been studied more thoroughly, may be classed as a sub-faunal district.

The author deems this area, to which he has given the name, "Transverse Volcanic," one of the major biotic provinces of Mexico. In fact, the preliminary statistical appraisal of our specimens from the area would indicate that it may be the most important province of all, at least in respect to the number of endemic forms occurring within it. The author has made a survey, admittedly provisional, of all the bird forms found within the boundaries of Mexico and has completed a more careful study of those breeding within this province and the adjacent provinces on each side. By a conservative estimate it would seem that at least eighty forms are confined to the province, whereas less than sixty are limited to the next largest biotic province, the Yucatán Peninsula, and less than fifty to the third largest, the Veracruz. Further study with more adequate material may either increase or reduce

these figures, because new forms will be described which will be found confined to the Transverse Volcanic and some, which now appear to be confined to it, will prove to range into other provinces. The proportions between the number of endemics probably will not be greatly changed.

The author has ventured to make this preliminary and obviously inadequate study of the Transverse Volcanic Province and its ornithological relationships to adjacent provinces, because of the truly great amount of fresh material from it alone, now available to him in our collection. This amounts to approximately fifteen thousand specimens of birds alone, all collected during the past eleven years by the following Mexican and American collectors: Mario del Toro Avilés, Pablo Roveglia, and the American collectors Wilmot W. Brown and Chester C. Lamb. Mr. Brown made special trips for the author in the middle 30's to two of the famous type localities of Swainson—Real del Monte, Hidalgo and Temascaltepec, in the state of Mexico. Each collection consisted of more than five hundred specimens, beautifully prepared, and the latter one brought to light the diverse zonal characteristics of the Temascaltepec region, part of it tropical and part temperate. By far the largest collection, approximately ten thousand specimens, was amassed by Chester C. Lamb, who, beginning with the year 1938, established a large number of collecting-sites over the entire province and for over six years has made his home at Irapuato in the northern part of the province. The only other large collection of birds obtained from the province was that of Nelson and Goldman, who traversed it rather rapidly, but displayed extreme acumen in the species they collected, which resulted in the description of many new forms. Theirs must be considered the basic collection, although it does not nearly equal that of Mr. Lamb.

The most important analysis of the birds of any portion of the province is that by Blake and Hanson (1942), who confined their work to one mountain and its southern basal extension in Michoacán, that of the Cerro de Tancítaro. This is an excellent paper and provides a great deal of information, especially regarding the zones of Tancítaro and the forms inhabiting them. That it is not completely adequate, is not due to the fault of the members of the expedition nor to the authors, but to the paucity of the series of birds collected, which amounted to only 481. The high level of this paper is all the more remarkable when one realizes that only an average of about three individuals, for each one of the 144 forms treated, was taken by the collectors. This ac-

counts in part for the uncertainty of the identification of some material. Apparently the authors did not know that, by the time their first collection was made, Mr. Lamb had already amassed several thousand specimens from the state of Michoacán, and had collected every form mentioned by Blake and Hanson (1942, p. 519) except some of their "West Mexican Arid Tropical Fauna" forms, which I assign to the Nayarit-Guerrero Province of the west coast, where Lamb has collected them. In fact, it is only fair to Mr. Lamb, and not derogatory to Blake and Hanson's exceedingly fine article, to state that his collection contains many forms not taken previously by anyone, such as *Otus asio sortilegus* and *Otus vinaceus seductus* and others not mentioned herein, as only ones requiring mention for the purposes of this paper are now considered. More than twenty-five thousand specimens have been collected by him in the Transverse Volcanic Province and in the other most important of the adjacent provinces, specifically considered herein, such as the Sinaloa, the Sierra Madre Occidental, the Chihuahua, the Sierra Madre Oriental, the Tamaulipas and the Veracruz.

The present paper does not pretend to be a complete analysis of this vast collection, but most series of critical forms have been examined with reasonable care. The author regards it merely as a preliminary effort to stimulate future research in the provinces and biotic districts of Mexico. Undoubtedly, some of the conclusions and statements will have to be modified in the light of more adequate material obtained later and the author himself may amend some of them, when he has examined more thoroughly the entire collection under his control.

Acknowledgment is herewith made of how deeply the author is indebted to many museums and individuals for their courtesy in permitting him to examine their material, these including the United States National Museum, the Biological Survey, Museum of Comparative Zoology and the American Museum of Natural History. Special thanks should be given to Dr. Herbert Friedmann and Dr. Alexander Wetmore of the United States National Museum; also to Major E. A. Goldman and Mr. John W. Aldrich of the Fish and Wildlife Service (formerly the Biological Survey), and Mr. George Willett of the Los Angeles Museum. Mr. James L. Peters of the Museum of Comparative Zoology was very generous in permitting the author to employ the nomenclature adopted by him in his unpublished manuscript of the *Trochilidae* for the Birds of the World.

Major Goldman's assistance should be emphasized. It hap-

pened that this article already was well advanced in manuscript form when Major Goldman and the author decided to join in a separate paper on "The Biotic Provinces of Mexico," which is now in the hands of the publisher. When the author called attention to his proposal to recognize the Sierra de Anáhuac volcanic area as a separate "Transverse Volcanic Province," Major Goldman approved the decision as well justified by the mammalian data and agreed to insert it as one of the most important biotic provinces to be considered by our joint paper. Since then Major Goldman has given generously of his advice. Both of us have been astonished at the closeness of the boundary lines of the provinces of Mexico, when determined independently by the two authors from the standpoint of their ornithological, mammalian and botanical life respectively. Major Goldman should be given credit for names of provinces, mentioned in this report, except that of the Transverse Volcanic. Throughout the tables only the reasonably certain breeding ranges of birds are considered and winter records are disregarded. On the map, solid red lines enclose biotic provinces; broken red lines mark off faunal districts within the provinces.

As to the affinities of adjacent provinces, the Sierra Madre del Sur Province has very much in common with the Transverse Volcanic, but the same is true only in a less degree of the two other adjacent high altitude provinces of Mexico, the Sierra Madre Occidental and the Sierra Madre Oriental. As will be noted in Tables 3 and 4, of the fifty-two forms selected because they occur in only two or three provinces, fifteen are common to the Transverse Volcanic and the Sierra Madre del Sur and to no others, seven are common to the Transverse Volcanic and the Sierra Madre Oriental and to no others, and eight are common to the Transverse Volcanic and the Sierra Madre Occidental and to no others. Another adjacent province of fairly high altitude, that of the Chihuahua of the Central Plateau, has seven forms common to it and the Transverse Volcanic and to no others. The only other high altitude province of Mexico is the far distant Chiapas Highlands, which is isolated, and an analysis of its forms indicates that it has less in common with the Transverse Volcanic. The same is even more true of all the lowland provinces, the Nayarit-Guerrero Coastal Province and the Tehuantepec Province, they seeming to have no form proved to be in common with the Transverse Volcanic, which is not also common to at least one other province. Therefore, it would seem reasonable to deduce from the above, that in spite of the fact that the Trans-

verse Volcanic has within its borders Arid and Humid Tropical Zones, this province may be characterized as having its chief affinities with provinces ranging from 5000 feet in altitude up. The author does not consider this study in any sense complete, so he will attempt very few other deductions from the data supplied in the tables. One reason for this decision is that the tables do not include the very large number of high altitude forms of northern origin, which are found resident in more than three provinces of Mexico, nor any of the migrant forms. Even without this important unlisted northern element, it will be noted that a great many of those listed as confined to the Transverse Volcanic in the two tables, must have originated in the north.

Seemingly this paper constitutes the first attempt to delimit the faunal districts of the province from an ornithological point of view, if not from any other. In making this statement, the author is fully acquainted with the pioneer work of students of other kinds of zoological life, such as Hobart M. Smith (1940) in his "An Analysis of the Biotic Provinces of Mexico, As Indicated by the Distribution of the Lizards of the Genus *Sceloporus*," and the study made by Nelson, as quoted by Merriam (1895), showing the remarkable distribution of the pocket gophers. It is possible to divide this province into seven separate faunal districts and one of these, the Mount Zempoaltepec region, herein believed to be only a sub-faunal district, may eventually be given higher rank. Five forms are confined to this last area, but for several reasons the author has deemed it best to include it tentatively with the birds of the Mount Orizaba area, to be known as the Orizaba-Zempoaltepec Faunal District, and for the present to consider the province as having only five faunal districts. As this paper deals exclusively with birds, it seems better to employ the term "faunal district" rather than "biotic district."

Regarding the names given to the faunal districts, as well as to the province itself, the author has followed a conviction which he has had for some years, that names should be chosen with care and from the following categories of available ones, in the order listed:

(1) Names of sedentary Indian tribes, whose boundaries correspond fairly well with those of its zoological life. In making such a choice, it is well to avoid the names of tribes which were or are of a nomadic nature, changing their locations frequently, since such names sound out of place in studies of biotics, which deal more with sedentary than with transient or migratory life. However, the employment of some aboriginal names, which would meet the above requirements, might lead to confusion, as would be true

of the designation "Mexicano," if one followed Lumholtz' map of the Indian tribes of Mexico, to which name he seems to refer the large group of Nahuatls, including many component divisions, such as the Aztecs.

(2) Names of important topographical features of the country, such as the four great sierras of Mexico. Considered under this category, the best name for the province is "Sierra de Anáhuac," an ancient one given to the great transverse volcanic range by its natives. Unfortunately, the name has been employed by geologists for the main Central Plateau of Mexico and its use in connection with the Transverse Volcanic Biotic would create endless confusion.

(3) Names descriptive of important physical characteristics of the whole province. The name "Transverse Volcanic" was chosen on this basis.

(4) Names of political states are as a rule undesirable, but when their boundaries coincide fairly well with that of the province to be named and no name of the previous three categories is available or deemed desirable, such a political name may be employed. When possible, it is well to avoid names that are not of native origin, some designations of Mexican states, such as "Durango," being taken from political entities in Spain.

The names "Tarascan," "Otomi" and "Aztec" for districts were chosen under category (1) and seem particularly appropriate, since the habitat of each tribe has almost the same limits as that of the zoological life. The name "Mexicano" for the extreme western faunal district of the province would have been confusing, not only with the name of the country, but also with that of the state of Mexico, which lies in a different part of this same province. In this case, the political name "Jalisco" appears to be the least inappropriate.

The inner boundary lines of the faunal districts are tentative and may be changed when a more complete analysis is possible of the available material. The greatest difficulty was encountered in determining the eastern boundary of the Jaliscan district and the western boundary of the Tarascan, since this line intersects a region, which is characterized by intergrades in many plastic species.

We might conclude from Table 2 that the Orizaba-Zempoaltepec District, with twenty-one forms confined to it and a total of forty-one of the eighty-three endemic forms of the province occurring in it, is the most important. Of these twenty-one, however, none represents a genus and only two are full species. But, if this district should be divided ultimately into two, the resulting new districts would each be no stronger than the Aztec. The second most important district is the Aztec with ten forms confined to it, consisting of one genus and one full species, with a total representation of thirty-six of the

endemic forms of the province. The Jaliscan District is third in importance with nine endemic forms. The Otomi District with only three forms confined to it and only fifteen of the total endemic forms of the province is unquestionably the weakest, and also probably has the lowest average altitude with no very high mountains in it. Perhaps its endemic weakness would be expected, because of the almost entire absence of the higher zonal elements of the rest of the districts.

Some additional deductions may be made, provided one keeps in mind the tentative nature of a report of this kind and the additional information that may be obtained from more thorough collecting and that is, that of the eighty-three forms confined to the province, four appear in all five districts and not in any other provinces, and an interesting total of eight appear in the three districts, the Tarascan, Aztec and Orizaba-Zempoaltepec, which have the highest mountains of the province. Mention has been made previously that the Transverse Volcanic Biotic apparently has more affinities with the Sierra Madre del Sur Province, than with any other province in Mexico and in a lesser degree has important affinities with the Sierra Madre Oriental, the Sierra Madre Occidental and the Chihuahua Provinces.

Table 3 gives statistics of one method of showing the relationships between the Transverse Volcanic Province and the four other provinces mentioned above. This Table disregards all forms which appear in more than three provinces, in order to eliminate wide-ranging species that are not greatly subject to the effects of environmental changes. The author has not yet analyzed the component elements of these other four provinces to the extent that he has the Transverse Volcanic, but this much may be deduced on the evidence to date that, next to the Transverse Volcanic, the Sierra Madre Occidental is the richest in endemic bird-life, both in numbers and rank. Of the forty-five forms restricted to the Sierra Madre Occidental, one is a genus *Xenospiza;* another genus, *Cyanocorax,* occurs nowhere else north of Costa Rica; and of a third genus, *Otophanes,* only a single specimen has been taken in any other province and that probably not a breeding bird. Very little collecting had been done in the Tepehuane Faunal District of the Sierra Madre Occidental Province prior to the inception of our collecting program in this massive mountain range. The veteran collectors, Nelson and Goldman, to whom so much of our knowledge of Mexican zoological life is due, crossed this range in one or two places, but were moving rapidly and, although new forms were discovered, the total number of

specimens taken was not large. That most expeditions, even that of J. H. Batty in 1903, did not do extensive work in the higher portions of the ranges, is indicated by the failure to obtain specimens of such very remarkable endemic forms as *Asio stygius lambi, Otophanes mcleodii* and particularly such a conspicuous jay as *Cyanocorax dickeyi.* In the spring of 1931, Alfred M. Bailey and H. B. Conover (1935), although they were only a few days in the foothills of the Sierra Madre Occidental west of Durango City, Durango, secured specimens which provided the basis for the description of the new species and genus, *Xenospiza baileyi.* The only intensive collecting that has ever been done in the Tepehuane District is that of C. C. Lamb, who made his first camp-site on May 20, 1934 at Santa Gertrudis, Sinaloa, at an elevation of 6200 feet near the northern limits of the Tepehuane District. During the next four years, at least twenty collecting stations were established along the higher parts of the range, covering the length of it throughout Sinaloa and as far south as the vicinity of the city of Tepic, Nayarit. Between four and five thousand specimens were taken in this district by Mr. Lamb or my associates, but the great majority by Lamb.

There is not nearly so fine a representation anywhere of the bird-life of the Tarahumaran District to the north. Save for our own fair-sized collections from the southern part of this district made by Mr. Lamb at a few stations and by myself on a separate expedition to the Barranca del Cobre, the only other major collections worth mentioning have been that of M. Abbott Frazar in 1887 and 1888, the small collections made by John C. Cahoon about the same time, and by R. R. McLeod from 1883 to 1885, as reported by van Rossem (1934). Only Frazar and McLeod worked in the high sierras. In 1890, Carl Lumholtz began his explorations, which carried him eventually the length of the Sierra Madre Occidental and a small collection of birds was preserved.

The Sierra Madre Occidental Province is clearly divisible ornithologically into three faunal districts, of which the two largest and most important are the Tepehuane, occupying approximately the lower half of the province, an area which is named for the Tepehuane Indians who live in a large part of the region, and the almost equally important Tarahumare Faunal District, occupying the major portion of the northern part of the province. The higher portion of these two

districts is found for the most part in the Transition Zone, whereas the lower portion of the northern district drops into the Upper Austral Zone. The climate of the lower altitudes is rather dry, but the Transition Zone on some mountains, such as the highest one, Mount Mohinora, reaching an altitude of nearly 3500 feet above the general level of the range and an altitude above sea level of somewhat less than 12,000 feet, is subjected to rather frequent rains in the summer months and snow as late as the month of May. During this month of the year 1937, the ground about the author's tent at the 10,500 foot level, was covered with snow an inch and a half deep on two different days and ice formed on the stream in front of his camp.

On the western side of the Tepehuane District, this province drops rather abruptly, in some places precipitously, into the Upper Arid Tropical Zone of Sinaloa, which is deemed by the author to have so little in common with the Sierra Madre Occidental Province, that it is placed by him in the Sinaloa Biotic Province. The author's collection from the Sinaloa Province is the largest and most adequate one which has been taken in any single province of Mexico.

The author has gone far enough in his study of the birds of the Sinaloa Province to convince him it should be divided into at least three faunal districts. To the two southern ones he has given the names "Sinaloa Coastal" and "Tebaca" Faunal Districts, the latter being the name of the tribe which occupies a considerable portion of that district. The northern district is called the Alamos Faunal District, in view of the fact that it includes a considerable portion of a district in southern Sonora and extreme northern Sinaloa, to which van Rossem (1931) gave that name. How far to the south the Tebaca and Sinaloa Coastal Faunal Districts extend is still uncertain, but further light will be thrown upon this question when our large collections now available from Nayarit are analyzed. Such material as the author has examined would seem to indicate that these two districts and the Sinaloa Province itself may extend as far as the Sierra de Vallejo in southern Nayarit, where it comes close to the Pacific Ocean and acts as a barrier to prevent coastal-loving, low-altitude forms from extending their habitats farther in that direction. In this respect, the ornithological picture may not be the same as the mammalogical or that obtained from the study of other categories of zoology. For these, the great Rio Grande de Santiago of central Nayarit and its deep gorge may act as a barrier.

Collecting in the Sierra Madre Oriental at high elevation has been much less thorough and almost negligible, except for a few collecting stations made by Mr. Lamb and by Sutton and his associates at medium altitudes in the range. No attempt can be made here to define the faunal districts of this province. However, the material that is available proves that its bird-life is allied to that of the Transverse Volcanic Biotic.

I have already alluded to the importance of the Sierra Madre del Sur Biotic as the one whose affinities are probably closer than any other biotic to that of the Transverse Volcanic. Sufficient material is available to make certain that there are at least three faunal districts involved, but, since their outlines can be indicated only roughly, no attempt will be made at this time to demark them, when it is obvious that the boundaries would have to be revised, as soon as the component elements of the bird-life can be intensively studied.

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TABLE 1

Showing Distribution of Forms of Bird-Life by Faunal Districts in the Transverse Volcanic Biotic Province, Mexico.

x = Known from the district. X = Entirely confined to the district.

	Jalis.	*Tarasc.*	*Otomi*	*Aztec*	*Ori-Zem*
1. *Dendrortyx barbatus*	—	—	—	—	X
2. *Dendrortyx macroura macroura*	—	—	—	x	x
3. *Dendrortyx macroura griseipectus*	—	—	—	X	—
4. *Dendrortyx macroura diversus*	X	—	—	—	—
5. *Dendrortyx macroura oaxacae*	—	—	—	—	X
6. *Lophortyx douglasii teres*	X	—	—	—	—
7. *Colinus virginianus graysoni*	x	x	x	x	—
8. *Colinus virginianus nigripectus*	—	—	—	X	—
9. *Colinus virginianus thayeri*	—	—	—	—	X
10. *Meleagris gallopavo gallopavo*	—	x	—	x	x
11. *Rallus longirostris tenuirostris*	—	—	—	X	—
12. *Coturnicops noveboracensis goldmani*	—	—	—	X	—
13. *Geococcyx velox velox*	—	—	—	—	X
14. *Otus asio sortilegus*	—	X	—	—	—
15. *Otus vinaceus seductus*	—	X	—	—	—
16. *Otus flammeus flammeus*	x	x	x	x	x
17. *Otus guatemalae cassini*	—	—	—	—	X
18. *Cynanthus latirostris propinquus*	—	x	x	—	—
19. *Thalurania furcata ridgwayi*	X	—	—	—	—
20. *Lampornis amethystinus amethystinus*	—	—	—	x	x
21. *Xiphocolaptes promeropirhynchus sclateri*	—	—	—	—	X
22. *Sittasomus griseicapillus jaliscensis*	X	—	—	—	—
23. *Mitrephanes phaeocercus phaeocercus*	—	x	—	x	x
24. *Empidonax difficilis immemoratus*	—	—	—	—	X
25. *Empidonax albigularis axillaris*	—	x	—	x	x
26. *Aechmolophus mexicanus*	—	—	—	X	—
27. *Megarynchus pitangua caniceps*	X	—	—	—	—
28. *Chionophilos alpestris chrysolaema*	x	x	x	x	x
29. *Cyanolyca nana*	—	—	—	—	X
30. *Aphelocoma coerulescens sumichrasti*	—	—	—	—	X
31. *Aphelocoma sordida colimae*	X	—	—	—	—
32. *Aphelocoma sordida sieberii*	—	x	—	x	x
33. *Aphelocoma unicolor unicolor*	—	—	—	—	X
34. *Cyanocitta stelleri coronata*	—	x	x	x	—
35. *Cyanocitta stelleri azteca*	—	x	—	x	—
36. *Parus sclateri sclateri*	—	x	—	x	x

TABLE 1—*Continued*

	Jalis.	*Tarasc.*	*Otomi*	*Aztec*	*Ori-Zem*
37. *Certhia americana jaliscensis*	X	—	—	—	—
38. *Cistothorus platensis tinnulus*	—	X	—	—	—
39. *Heleodytes megalopterus megalopterus*	—	x	—	x	—
40. *Heleodytes megalopterus nelsoni*	—	—	—	—	X
41. *Heleodytes jocosus gularis*	x	x	x	—	—
42. *Thryothorus felix grandis*	—	—	—	X	—
43. *Thryomanes bewickii bairdi*	—	—	—	—	X
44. *Thryomanes bewickii percnus*	x	x	—	—	—
45. *Troglodytes brunneicollis nitidus*	—	—	—	—	X
46. *Henicorhina leucophrys mexicana*	—	—	—	—	X
47. *Salpinctes obsoletus notius*	x	—	x	x	x
48. *Catherpes mexicanus mexicanus*	x	x	x	x	x
49. *Toxostoma ocellatum*	—	—	—	x	x
50. *Toxostoma curvirostre curvirostre*	x	x	—	—	—
51. *Toxostoma curvirostre deflexum*	—	—	—	X	—
52. *Toxostoma curvirostre vetula*	—	—	—	—	X
53. *Catharus occidentalis occidentalis*	—	—	—	—	X
54. *Sialia mexicana australis*	—	x	—	x	x
55. *Regulus satrapa aztecus*	—	x	—	x	x
56. *Ptilogonys cinereus cinereus*	x	x	x	x	x
57. *Vireolanius melitophrys goldmani*	—	—	—	X	—
58. *Vireo nanus*	—	X	—	—	—
59. *Vireo gilvus amauronotus*	—	—	—	—	X
60. *Vireo gilvus eleanorae*	—	—	X	—	—
61. *Neochloe brevipennis brevipennis*	—	—	—	—	X
62. *Dendroica aestiva dugesi*	x	x	x	x	—
63. *Geothlypis trichas melanops*	—	x	x	—	—
64. *Geothlypis chapalensis*	—	—	X	—	—
65. *Geothlypis speciosa*	—	x	—	x	x
66. *Geothlypis nelsoni nelsoni*	—	—	—	—	X
67. *Ergaticus ruber ruber*	x	x	—	x	x
68. *Basileuterus belli belli*	—	—	—	x	x
69. *Cassidix palustris*	—	—	—	X	—
70. *Agelaius gubernator grandis*	—	—	—	x	x
71. *Piranga bidentata bidentata*	x	x	—	—	—
72. *Carpodacus mexicanus centralis*	—	—	X	—	—
73. *Carpodacus mexicanus coccineus*	X	—	—	—	—
74. *Carpodacus mexicanus roseipectus*	—	—	—	—	X
75. *Atlapetes torquatus virenticeps*	x	x	x	x	—
76. *Pipilo torquatus alticola*	X	—	—	—	—
77. *Pipilo torquatus nigrescens*	—	X	—	—	—
78. *Pipilo fuscus fuscus*	x	x	—	—	x
79. *Pipilo fuscus toroi*	—	—	—	—	X

TABLE 1—*Continued*

	Jalis.	*Tarasc.*	*Otomi*	*Aztec*	*Ori-Zem*
80. *Aimophila ruficauda acuminata*	x	x	—	x	—
81. *Aimophila rufescens pallida*	x	x	—	—	—
82. *Melospiza melodia pectoralis*	—	—	—	X	—
83. *Melospiza melodia adusta*	—	X	—	—	—

TABLE 2

The Number of Genera, Species, and Subspecies of Endemic Birds Recorded From the Different Faunal Districts of the Transverse Volcanic Biotic Province.

	Genera	*Add'l Species*	*Add'l Subspec.*	*Total*
Confined to Jaliscan	—	—	9	9
Confined to Tarascan	—	1	5	6
Confined to Otomi	—	1	2	3
Confined to Aztec	1	1	8	10
Confined to Orizaba-Zempoaltepec	—	2	19	21
Common to Jaliscan and Tarascan, but not in others	—	—	4	
Common to Jaliscan and Otomi, but not in others	—	—	0	
Common to Jaliscan and Aztec, but not in others	—	—	0	
Common to Jaliscan and Orizaba-Zempoaltepec, but not in others	—	—	0	
Common to Tarascan and Otomi, but not in others	—	—	2	
Common to Tarascan and Aztec, but not in others	—	—	2	
Common to Tarascan and Orizaba-Zempoaltepec, but not in others	—	—	0	
Common to Tarascan, Aztec, Orizaba-Zempoaltepec, but not in others	—	—	8	
Common to Otomi and Aztec, but not in others	—	—	0	
Common to Otomi and Orizaba-Zempoaltepec, but not in others	—	—	0	
Common to Aztec and Orizaba-Zempoaltepec, but not in others	—	—	5	
Common to all five Districts	—	—	4	

TABLE 3

Showing Distribution of Forms in the Five Provinces of Central Mexico Which Have the Closest Ornithological Relationships. No Form is Shown Unless It Appears in At Least Two and Not More than Three of the Five Provinces.

	Tr. Vol.	*S. Occ.*	*S. Ori.*	*S. Sur.*	*Chih.*	
1. *Dendrortyx macroura striatus*	X	—	—	X	—	
2. *Philortyx fasciatus*	X	—	—	X	—	
3. *Meleagris gallopavo mexicana*	X	X	—	—	X	
4. *Chaetura rutila griseifrons*	X	X	—	—	—	
5. *Otus asio suttoni*	X	—	—	—	X	
6. *Amazilia beryllina beryllina*	X	—	—	—	—	*
7. *Centurus chrysogenys flavinuchus*	X	—	—	X	—	
8. *Centurus hypopolius*	X	—	—	X	—	
9. *Campephilus imperialis*	X	X	—	—	—	
10. *Dryobates villosus jardinii*	X	—	—	X	—	
11. *Dryobates scalaris azelus*	X	—	—	X	—	
12. *Dryobates scalaris centrophilus*	X	X	—	—	—	
13. *Lepidocolaptes leucogaster leucogaster*	X	X	—	X	—	
14. *Grallaria guatimalensis ochraceiventris*	X	—	—	X	—	
15. *Elaenia viridicata jaliscensis*	X	X	—	X	—	
16. *Empidonax affinis affinis*	X	—	X	—	—	
17. *Empidonax affinis trepidus*	X	—	—	—	X	
18. *Empidonax difficilis occidentalis*	X	—	—	X	—	
19. *Empidonax fulvifrons rubicundus*	X	X	—	—	—	
20. *Calocitta formosa formosa*	X	—	—	—	—	†
21. *Cyanolyca pulchra mitrata*	X	—	—	—	—	‡
22. *Aphelocoma coerulescens cyanotis*	X	—	—	—	X	
23. *Aphelocoma sordida sordida*	X	—	X	—	X	
24. *Psaltriparus minimus iulus*	X	—	—	—	X	
25. *Psaltriparus minimus melanotis*	X	—	—	—	—	‡
26. *Certhia americana alticola*	X	—	—	—	—	‡
27. *Heleodytes jocosus jocosus*	X	—	—	X	—	
28. *Thryomanes bewickii murinus*	X	—	—	—	X	
29. *Henicorhina leucophrys festiva*	X	—	—	X	—	
30. *Toxostoma dorsale dumosum*	X	—	—	—	X	
31. *Toxostoma curvirostre celsum*	X	—	—	—	X	
32. *Turdus migratorius phillipsi*	X	—	X	—	—	
33. *Turdus migratorius permixtus*	X	—	—	X	—	
34. *Turdus infuscatus*	X	—	—	—	—	‡
35. *Catharus mexicanus mexicanus*	X	—	—	—	—	‖
36. *Catharus occidentalis fulvescens*	X	—	—	X	—	

For explanation of footnote symbols, see end of table on next page.